Response to "Alternative Water Supply" and "Dry Cooling"
Panoche Energy Center
Preliminary Staff Assessment, June 2007

The Required Energy Commission Findings in the Soil and Water Resources Section of the Preliminary Staff Assessment (PSA) states the following on page 4.9-18, "At this time staff considers, recycled water from the City of Mendota, upper aquifer water, and dry-cooling viable alternatives."

The Panoche Energy Center (PEC) evaluated each of these alternatives, among others, prior to submitting its AFC. The PEC AFC determined that use of the confined aquifer (described as the "lower aquifer" in the AFC) is the only alternative that is not environmentally undesirable and economically unsound. As the PEC studied and responded to Data Adequacy, Data Requests, Technical Memos, and now the PSA, these determinations confirmed that the use of the confined aquifer is the right choice for consumers.

This response references earlier docketed correspondence, and provides further details documenting the determination that the alternatives presented in the PEC PSA are environmentally undesirable and economically unsound, and supporting the use of the confined aquifer as the PEC water supply.

Semi-Confined (Upper) Aquifer Water

As discussed in the AFC, first technical memo (March 2, 2007), and second technical memo (March 23, 2007), after careful and repeated consideration, the semi-confined aquifer alternative has been determined to be environmentally undesirable and economically unsound. The following response summarizes earlier points and includes additional discussion on which this determination is based.

Technical Considerations. The groundwater quality within the semi-confined aquifer underlying the site is impacted by high concentrations of several constituents including total dissolved solids (TDS), sulfate, hardness, and silica. Significant pretreatment would be necessary to pre-treat the groundwater from the semi-confined aquifer prior to use in the PEC. The only proven effective pre-treatment method is a lime and soda ash softening system for treating suspended and dissolved solids, silica, hardness, and alkalinity. Industrial lime and soda ash softening systems are designed for continuous operation and take approximately 24 hours to start up; they are unsuitable for start-stop operation. Therefore, incorporation of a lime and soda ash softening system to treat silica, hardness, and alkalinity at the levels encountered in groundwater within the semi-confined aquifer underlying the PEC is incompatible with the plant design and Pacific Gas & Electric (PG&E) requirements that mandate the plant to be up to full load in 10 minutes. The treatment system required for this water supply source would result in significant environmental and economic impacts as discussed below.

Use of the Semi-Confined Aquifer for PEC Water Supply is Environmentally Undesirable

Incorporation of a lime and soda ash softening system alone would require the PEC to acquire an additional 2 to 4 acres of land. This additional land use would further impact the migration corridor for the San Joaquin Kit Fox. The treatment system would require storage of chemicals, transport, delivery, and storage of lime and soda ash as well as the unloading, transport, and delivery to and disposal of sludge in a landfill. There would be a potential impact to air quality from lime and soda ash dust. There would be increased noise associated with the additional treatment equipment. Further treatment by reverse osmosis would have additional environmental impacts including an estimated 25% increase in the makeup water demand and an equivalent increase in the amount of wastewater for disposal. The environmental impacts resulting from the need to incorporate lime and soda ash softening and reverse osmosis for treatment of cooling tower makeup makes the use of groundwater from the semi-confined aquifer environmentally undesirable.

Use of the Semi-Confined Aquifer for PEC Water Supply is Economically Unsound

The semi-confined aquifer water quality exceeds the combustion turbine manufacturer's recommended limits for open loop cooling with respect to chloride and sulfate. Lime and soda ash softening would not reduce these constituents making it unacceptable for use as cooling tower makeup without further treatment. Reverse osmosis could theoretically be used to remove chloride and sulfate.

Use of groundwater from the semi-confined aquifer will also impact the reliability of water supply. Based on the Westlands Water District's experiences in attempting to operate wells in the semi-confined aquifer, the relatively high concentrations of sulfate, along with other minerals dissolved in the semi-confined aquifer groundwater, cause significant encrustation, corrosion, and abrasion of pumps. This would reduce the reliability of the water supply system and the ability of the PEC in meeting its contract to provide reliable power to PG&E.

Bibb and Associates has estimated the increased capital costs for a lime and soda ash softening system, required water storage, and sludge thickening, dewatering and transport facilities to be approximately $12 million (M) dollars compared to using water from the confined aquifer. The annual operations and maintenance costs are estimated to increase by $2.9M. Reverse osmosis treatment of the pretreated water for use as cooling tower makeup would add approximately $6 million to the capital costs and more than double the operations and maintenance costs. There would also be added costs for the increased repair and maintenance requirements for the extraction wells due to significant encrustation, corrosion, and abrasion of pumps. Increased wastewater production from a reverse osmosis system would increase the cost of wastewater disposal by approximately 50%. The capital and operations and maintenance costs of incorporating lime and soda ash softening and reverse osmosis for treatment of cooling tower makeup and maintaining the well system would make the PEC economically infeasible.

The need to expand the project site to provide for installation of a lime and soda ash softening system and an RO system use would trigger the Warren-Alquist Act causing additional delay for biological mitigation. Increased land would also require additional cancellation of land under

the Williamson Act. This would result in a 12 to18 month delay in the schedule and prevent the PEC from meeting the PG&E contract.

Based on the capital and operations and maintenance costs and the economic impacts that would result from schedule delays, it has been determined that use of the semi-confined aquifer for the PEC water supply is economically unsound.

Recycled Water from the City of Mendota

As discussed in the AFC and the first technical memo (March 2, 2007), even if Mendota were able to provide a sufficient volume of recycled water, this alternative was determined to be environmentally undesirable and economically unsound. The following response summarizes earlier points and includes additional discussion on which this determination is based.

Technical Considerations. The City of Mendota wastewater treatment plant (WWTP) does not produce the quantity of water needed for the PEC. The PEC would need a maximum of 2.25 million gallons per day and an average flow of 1.8 million gallons per day (MGD). The WWTP is currently producing 1.0 MGD. The PSA states that future water may be available from Mendota but PEC cannot rely on water that may be available at some future time. Therefore, the City of Mendota WWTP cannot supply the amount of water needed for the PEC.

Furthermore, the WWTP effluent would require additional treatment prior to use for the PEC. The City of Mendota only has secondary treatment of the effluent. Advanced treatment would be needed to reduce corrosion and scaling in the cooling towers. Treatment may include biological nutrient reduction, lime and soda ash addition, filtration, pH adjustment, and chlorination.

Use of Recycled Water from the City of Mendota for PEC Water Supply is Environmentally Undesirable

This alternative would require construction of approximately 18 miles of pipeline from Mendota to the PEC using public and private roadways. A more direct route requiring construction of about 12 to 14 miles of pipeline may be possible if PEC were to obtain easements from farmers to cross their land. In addition to providing a migration corridor for the San Joaquin Kit Fox, the more direct route would likely result in disruption and loss of habitat.

Use of Recycled Water from the City of Mendota for PEC Water Supply is Economically Unsound

The increased land use for the pipeline would trigger the Warren-Alquist Act causing delay for biological mitigation. There would also be a potentially significant schedule delay to seek permission from land owners to install the pipeline in the roadways or across their property. In addition, the pipeline would require crossing a railroad track and aqueduct. Permitting associated with crossing the railroad track and the aqueduct would cause a significant schedule

delay. The PEC cannot sustain the estimated delay of 12 to 18 months and meet the PG&E contract.

Bibb and Associates has estimated the capital cost for the materials and installation of a pipeline and lift stations to convey the effluent from the City of Mendota to the PEC to be approximately $20M. Additional costs (which are unknown at this time) include the operating costs of the pipeline and added water treatment costs. The City of Mendota WWTP is at a lower elevation than the PEC; there would be added energy and operations and maintenance costs to pump the water from the WWTP to the PEC. The PEC cannot sustain this added cost and remain viable under the pricing model that was used to secure the PG&E contract.

Based on the capital and operations and maintenance costs and the economic impacts that would result from schedule delays, it has been determined that use of effluent from the City of Mendota for the PEC water supply is economically unsound.

Dry Cooling

As discussed in the AFC and in subsequent referenced responses and technical memos, the dry cooling alternative was determined to be environmentally undesirable and economically unsound. The following response summarizes earlier points and includes additional discussion on which this determination is based.

Technical Considerations.

The PEC proposes to install a high-efficiency combustion turbine for power generation. GE's LMS100 is a unique technology designed to utilize an intercooler for the inlet air as it is compressed, allowing for approximately 10% greater thermal efficiency than existing commercial simple cycle peaking units. This design also requires an efficient methodology to reject the intercooled air heat under peak ambient conditions consisting of air temperatures of 114 °F. On page 4.9-17 the PSA cites several power plants that are located in similar climate conditions that use dry cooling. However, these power plants use combined cycle technology employing the steam-water system as a thermodynamic medium. This is a very different technology than the intercooler air technology proposed for the PEC.

Technical impacts from using dry cooling include a decrease of up to 25 megawatts (MW) per unit during high temperatures. Therefore, an additional LMS100 unit would be required to meet the delivery of 400 MW to the electric grid. This alternative option is not practical for peak conditions when the PEC is contractually required to deliver 400 MW of power to the grid; the PEC would not be able to provide sufficient cooling to the plant in order to produce the required amount of electricity without the addition of a fifth LMS100 unit which would result in significant environmental and economic impacts as discussed below.

Use of Dry Cooling at the PEC is Environmentally Undesirable

Environmental impacts resulting from using dry cooling would include the need to expand the PEC site by 5 to 7 acres to install the fifth LMS100 unit and to allow for conversion of other

units to dry cooling. This additional land use would impact the migration corridor for the San Joaquin Kit Fox. Also, the fifth LMS100 unit would result in the increase of fuel burned per MW, increasing air pollutant emissions up to 20% during peak conditions. As the impacts associated with this alternative are significant, the use of dry cooling at the PEC is environmentally undesirable.

Use of Dry Cooling at the PEC is Economically Unsound

It would take about twelve months to acquire another LMS100 unit. Additional time would also be required to permit the new unit. The site layout would need to be completely redesigned to allow for the fifth LMS100 unit and five dry fin-fan coolers in lieu of a single cooling tower. The increase in the size of the PEC site would trigger the Warren-Alquist Act causing an additional delay for biological mitigation. The PEC cannot sustain the expected delay of 12 to18 months and meet the PG&E contract.

Bibb and Associates has estimated that the additional installation of a fifth LMS100 unit would cost approximately $70M. The PEC cannot sustain this added cost and remain viable under the pricing model that was used to secure the PG&E contract.

Based on the capital costs and the economic impacts that would result from schedule delays, it has been determined that use of dry cooling for the PEC is economically unsound.

Conclusion

The alternatives identified in the PEC AFC have been determined to be environmentally undesirable and economically unsound. Conversely, evaluation of the use of the confined aquifer for the PEC water supply resulted in a determination that this alternative will not result in significant environmental impacts and is economically sound. Therefore, the confined aquifer is the proposed water supply for the PEC.